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(54) **Display apparatus**

(57) A display apparatus comprising a display unit further comprises at least one controllable illumination unit for providing a background light having a controllable color.

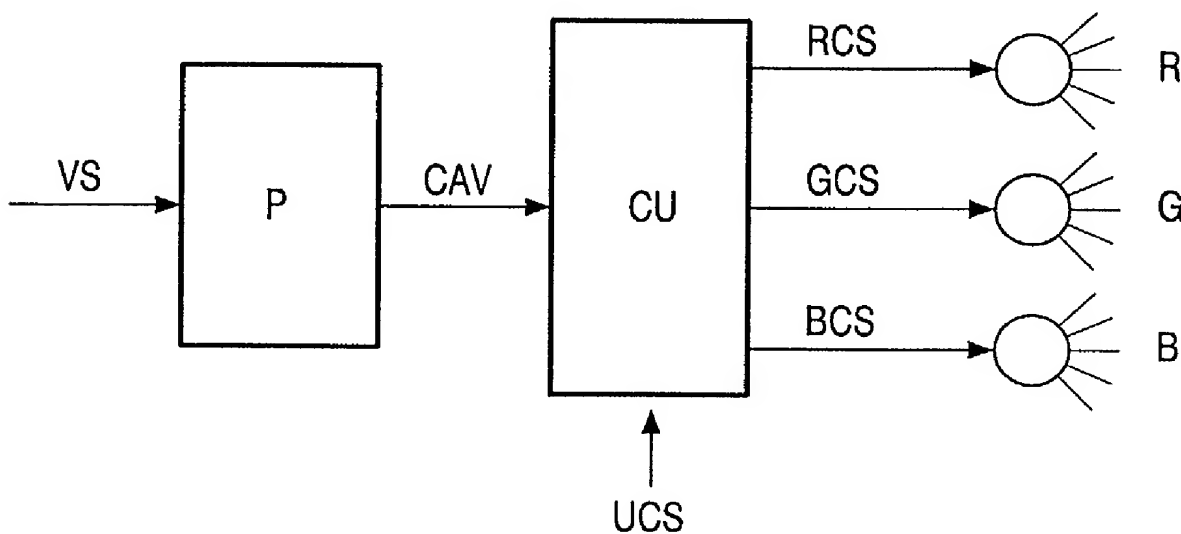


FIG. 3

Description

[0001] The invention relates to a display apparatus such as a television set, or a monitor, and to a method of operating an entertainment center.

[0002] Recently, large screen displays have become known that can be put on a wall like a painting. Such displays may be (part of) a television set having a tuner, or (part of) a monitor without a tuner.

[0003] It is, inter alia, an object of the invention to provide an improved display apparatus. To this end, the invention provides a display apparatus as defined in the independent claims. Advantageous embodiments are defined in the dependent claims. These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter. The attention of the reader is drawn to the fact that aspects of the invention described herein are covered by co-pending applications.

[0004] In the drawings,

Fig. 1 shows an embodiment of a display apparatus in accordance with the present invention;

Fig. 2 shows a block diagram of a first embodiment of a control circuit for use in a display apparatus in accordance with the present invention;

Fig. 3 shows a block diagram of a second embodiment of a control circuit for use in a display apparatus in accordance with the present invention; and

Fig. 4 shows a block diagram of a third embodiment of a control circuit for use in a display apparatus in accordance with the present invention.

[0005] Fig. 1 shows an embodiment of a display apparatus in accordance with the present invention. The display apparatus is preferably mounted on a wall in a room. In accordance with the present invention, the display apparatus has illumination units for providing a background light at left-hand and right-hand sides of the display apparatus, preferably mounted at the back of the display apparatus. In an alternative embodiment, the illumination units are mounted at the left-hand and right-hand sides of the display apparatus. In yet other alternative embodiments, (some of) the illumination units are directed to the viewer. As a result of the invention, the display apparatus, preferably a display apparatus having a wide-screen display unit, has a much larger impact on those present in the room, even when no video signal is displayed. Alternatively or in addition thereto, the display apparatus may have an illumination unit on top and/or bottom sides of the display apparatus, again mounted at the back of the display apparatus.

[0006] It is noted that Philips produces a low-end TV (13PT30L) with lighted legs, which are just ornamental, and do nothing to improve the impact on the viewer. Moreover, it has been proven that watching TV in an illuminated surrounding is less tiring than watching TV in a dark room. This is because the surrounding light

equalizes the difference between the different amount of screen light output. Clearly, the prior art lighted legs do not provide the advantage of the inventive illumination unit providing a background light having a controllable color. Moreover, Philips once produced a TV with an incandescent bulb inside, which equally does not provide the advantages of the present invention.

[0007] The illumination unit may create a neutral white background light. However, in accordance with an advantageous embodiment of the invention, the illumination unit may produce colored light, the color and brightness of which can be controlled so as to optimally fit in with the room and the wishes of the user. For example, the color could be tuned into a warmer color or a colder color. To this end, the embodiment shown in Fig. 2 has a control unit CU that produces red, green and blue control signals RCS, GCS, BCS that control red, green and blue LED illumination cells R, G, B mounted at the back side of the display apparatus, preferably in a sub-assembly in cooling units at the top and the bottom ends of light guides mounted along the left-hand and right-hand sides of the display apparatus. The control unit CU receives a user control signal UCS (that may be produced by a remote control signal reception device) to set the color in such a manner that it fits in with the room. While the illumination unit preferably employs LEDs, other light sources may be used in alternative embodiments. The control unit may receive a signal from a light sensor so as to make the light from the illumination unit dependent on ambient light as well.

[0008] In accordance with a further advantageous embodiment, the color of the light produced by the illumination unit depends on an average color of the video signal displayed on the display unit. To that end, the display apparatus includes a control circuit as shown in Fig. 3 for controlling the illumination unit in dependence of a video content of a video signal displayed on the display unit. This control circuit comprises a processor P, such as a suitably programmed microprocessor, that receives the input video signal VS and that produces an average color signal CAV in dependence thereon. The average color signal CAV is sent to the control unit CU that produces the red, green and blue control signals RCS, GCS, BCS that control the red, green and blue LED illumination cells R, G, B mounted at the back side of the display apparatus. By doing so, the LED illumination cells R, G, B are able to produce any color that matches the average color of the video signal VS. So, when an underwater scene is displayed, the illumination unit produces a blue-greenish light, while when a more reddish scene is shown, the illumination unit also produces a reddish color. As a result, the viewed scene will have a far greater impact on a viewer than the same scene when viewed on a prior art display apparatus. In a similar manner, the brightness of the light from the illumination units may depend on the brightness of the video signal.

[0009] In an advantageous embodiment, the color of the left-hand illumination unit depends on an average

color at a left-hand part of a picture displayed on the display screen, while the color of the right-hand illumination unit depends on an average color of a right-hand part of the displayed picture.

[0010] In accordance with a still further embodiment, the control circuit controls the illumination unit in dependence of an audio signal. In this manner, the display apparatus can be used as a light organ that advantageously uses the controllable illumination unit present in the display apparatus in accordance with the present invention. The embodiment of Fig. 4 matches that of Fig. 3, with the difference that instead of the video signal VS, an audio signal AS is applied to the processor P. Preferably, the audio signal corresponds to the video signal. In this manner, when a video clip of a pop artist is displayed, the illumination unit functions as a light organ that depends on the audio signal of the pop song sung by the pop artist.

[0011] In summary, in an advantageous embodiment, the screen is provided with a lighting system that lights up against the background. This ambient lighting is built-in in the rear side of the screen and can be controlled by the remote control of the TV set. The ambient lighting causes a comfortable way of watching TV because it equals the light relation between the screen and the surroundings. By way of the ambient lighting, an effect is created like the TV is floating in front of the wall. It can also be used in case of not watching TV, than it functions like as decorative element in the room. The invention provides the following ergonomic advantages. In a dark room with a TV, the TV is the only source of light. When watching TV, one is fixated on that only source of light. The intensity of the light changing very fast when the image in the screen changes. The eye has to adapt to changing of the amount of light. The eye will become tired after a while watching TV in a dark room. In a room with enough ambient light this problem does not appear because the difference in light production is not the only source of light that penetrates into the eye. Adding an ambient / background lighting will reduce the problem of watching TV with too little amount of light in the room.

[0012] It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. For example, the various embodiments shown in the drawings may be combined, so that a user selects whether the color produced by the illumination unit is fixed at a set color, whether and how the color depends on the video signal VS, and/or whether and how the color depends on the audio signal AS. The color of the light from the illumination units may depend on a signal that is transmitted with the video signal, such as a teletext signal. For example, such an additional signal could indicate relatively darker colors for a heavy metal band, while relatively brighter colors are indicated for pop music intended for a younger audience. The invention is advantageously used in an en-

tertainment center. The invention is not limited to TV screens hanging on the wall. In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. The word "comprising" does not exclude the presence of elements or steps other than those listed in a claim. The word "a" or "an" preceding an element does not exclude the presence of a plurality of such elements. The invention can be implemented by means of hardware comprising several distinct elements, and by means of a suitably programmed computer. In the device claim enumerating several means, several of these means can be embodied by one and the same item of hardware. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

Claims

1. A display apparatus, comprising:
 - a display unit;
 - at least one illumination unit for providing a background light; and
 - means for controlling color of the background light.
2. The display apparatus of claim 1, wherein the controlling means comprise a control circuit for controlling brightness and color of the background light.
3. The display apparatus of claim 1, wherein the controlling means comprise a control circuit for controlling the illumination unit in dependence on a video signal displayed on the display unit.
4. The display apparatus of claim 1, wherein the controlling means comprise a control circuit for controlling the illumination unit in dependence on an audio signal.
5. The display apparatus of claim 4, wherein the audio signal matches a video signal displayed on the display unit.
6. The display apparatus of claim 1, wherein the controlling means comprise a control circuit for controlling the illumination unit in dependence on a signal received with the video signal.
7. The display apparatus of claim 1, wherein the illumination unit comprises red, green and blue LEDs mounted at a light guide.
8. A method of operating an entertainment center, the method being **characterized by** using a display apparatus as claimed in claim 1.

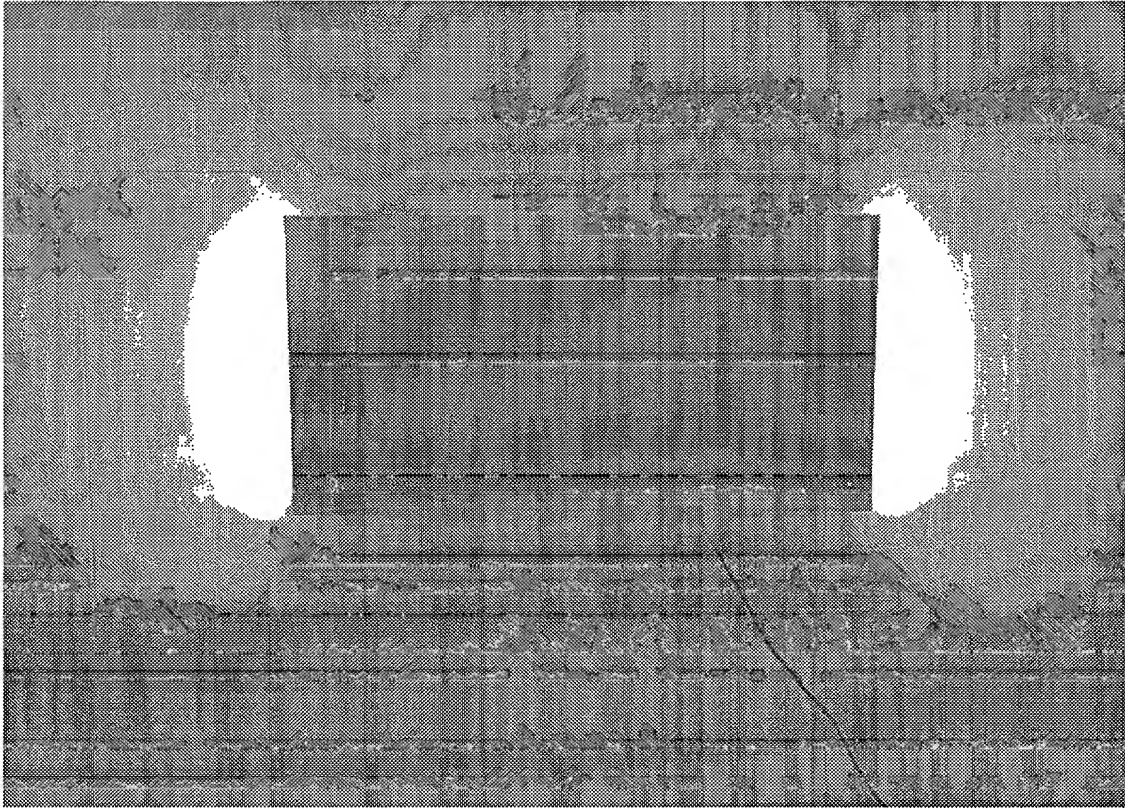


FIG.1

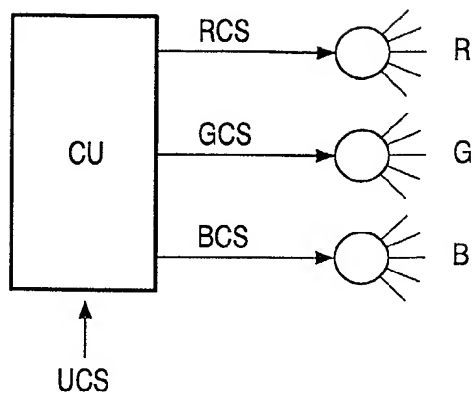


FIG. 2

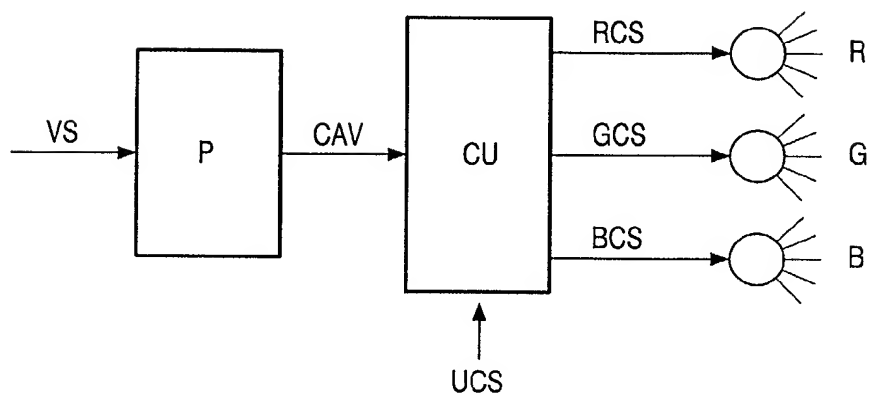


FIG. 3

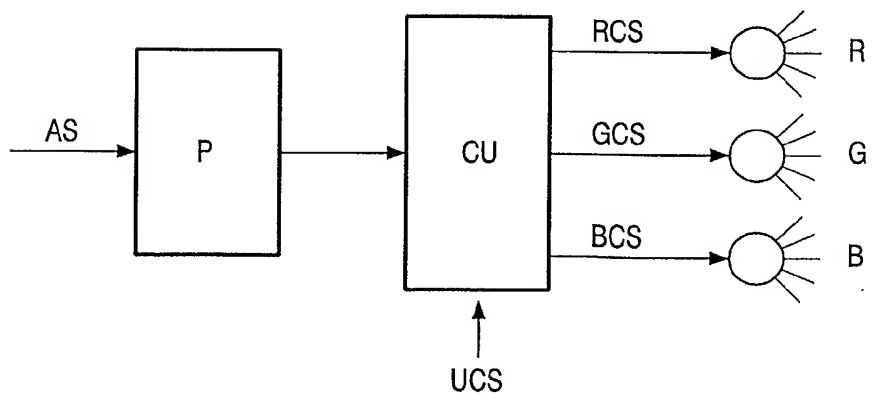


FIG. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 02 07 7696

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Y	* paragraphs [0013]-[0015],[0038] *	2-7	
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Y	US 5 408 387 A (MURASE SHINZO ET AL) 18 April 1995 (1995-04-18) * abstract; figure 11 *	7	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7) H04N G02F H05B F21V A63J
Place of search MUNICH		Date of completion of the search 28 November 2002	Examiner Brandenburg, J
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 (3-82) (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 02 07 7696

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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28-11-2002

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